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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/734,704	12/12/2003	Fred C. Redeker	LAM2P461	2329

25920 7590 03/22/2007

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ART UNIT	**PAPER NUMBER**
1734	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
2 MONTHS	03/22/2007	PAPER

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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/734,704
Filing Date: December 12, 2003
Appellant(s): REDEKER ET AL.

Kenneth Wright
For Appellants

EXAMINER'S ANSWER

This is in response to the appeal brief filed 12/1/06 appealing from the Office action mailed 5/23/06.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellants' statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is substantially correct. The changes are with respect to the grounds of rejection separately labeled B. and C. because a combination rejection under 102/103 was applied. Therefore, the correct ground of rejection is as follows: Claims 1-7, 22, and 24 were rejected under 35 U.S.C. 102(b)

as being anticipated by or, in the alternative, under 35 U.S.C. 103(a) as being obvious over Sandaiji et al.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

US 2005/0003737	MONTIERTH ET AL	1-2005
US 4,982,065	SANDAJII ET AL	1-1991
US 5,096,550	MAYER ET AL	3-1992
US 6,496,001	BARRINGER ET AL	12-2002
US 2004/0192173	ZUNIGA ET AL	9-2004
US 6,699,400	BALLANTINE ET AL	3-2004
US 6,900,889	BJORNSON ET AL	5-2005

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 1-8 and 22-24 are rejected under 35 U.S.C. 102(e) as being anticipated by Montierth et al (US 2005/0003737).

Montierth et al teach an apparatus for planarizing a wafer comprising a tank having a lid thereon (see Fig. 1A, 38) defined by a bottom and an enclosing wall, the tank being configured to contain an electrochemical solution; a wafer support structure (3802a) disposed within the tank, the wafer support structure being configured to support a wafer at a submerged position within

the electrochemical solution to be contained within the tank; a planar member (3802b) disposed above and substantially parallel to the wafer support, the planar member being capable of being positioned proximate the wafer because the work support structure holding the wafer can be positioned closer or further away from the planar member due to the work support structure varying in thickness (see Fig. la versus Fig. 38), the planar member providing an upper confinement boundary for material deposited on the wafer through the electrochemical reaction, and a radiant energy source (3804; microwaves [0482-0483] and [0490]) disposed above the planar member and above the wafer support, the radiant energy source being oriented to direct the radiant energy through the planar member and to the wafer supported by the support structure.

With respect to backing member, see element (3804).

With respect to the use of reflecting surfaces, see the abstract and various embodiments teaching reflecting surfaces to enhance reflection of the radiant energy in the tank (i.e., [0027], [0178], etc.).

Claims 1-7, 22, and 24 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Sandaiji et al (US 4,982,065).

Sandaiji et al disclose an apparatus for electrochemically treating a substrate comprising a tank (2), the tank being configured to contain an electrochemical solution; a wafer support structure (3) disposed within the tank, the wafer support structure being configured to support a wafer at a submerged position within the electrochemical solution to be contained within the tank; a planar member (7, see col. 8, line 14) disposed above and substantially parallel to the

wafer support being positionable proximate the wafer supported by the wafer support via use of a micrometer (6) such that the planar member provides an upper confinement boundary for material deposited on the wafer through the electrochemical reaction, and a radiant energy source (8) disposed above the planar member and above the wafer support, the radiant energy source being oriented to direct the radiant energy through the planar member and to the wafer supported by the support structure. Even though Sandaiji et al are silent concerning the use of the apparatus for planarization of the wafer, it would have been inherent and in the alternative obvious that the apparatus of Sandaiji et al would be used for electrochemical planarization of the wafer because the apparatus of Sandaiji et al is equivalent in structure to the instantly claimed invention. Moreover, even though the instantly claimed invention recognizes the use of tank configured to contain an electroless plating solution, the presently claimed invention does not require electroless plating solution such that the electroless plating solution has been read as material intended to be used in the apparatus and not a structural limitation.

With respect to a backing member, see lens system (10) against or oppose to the planar member or even immersed arms (not numbered) of adjustment mechanism (6) against or oppose to the planar member (7).

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Montierth et al (US 2005/0003737) in view of Mayer et al (US 5,096,550).

The teachings of Montierth et al have been mentioned above but Montierth et al are silent concerning the use of an in-tank heat exchanger. However, it was known in the art, at the time the invention was made, to provide an in-tank heat exchanger in order to control the

electrochemical processing of the workpiece by maintaining the electrochemical processing solution at a desired temperature as evidenced by Mayer et al (see col. 5, lines 60 to col. 6, lines 1-3). It would have been obvious to one of ordinary skill in the art to provide a heat exchanger as taught by Mayer et al in the tank of Montierth et al in order to control the electrochemical processing of the wafer via maintaining the electrochemical processing solution at a desired temperature.

Claims 21 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Montierth et al (US 2005/0003737).

The teachings of Montierth et al have been mentioned above but Montierth et al are silent concerning the planar member being positionable within 3 micrometers of the top of the supported wafer. However, because Montierth illustrates in various embodiments the work support being of varying thickness (see Fig. la versus Fig. 38) so as to be positionable closer to the energy source to enhance the intensity of the radiant energy released therefrom, it would have been obvious to one of ordinary skill in the art to determine via routine experimentation, the appropriate distance in micrometers of which to arrange the planar member relative to the wafer via controlling the positioning of the work support relative to the energy source in order to control the intensity of radiant energy released on the wafer during electrochemical processing.

With respect to claim 25, Montierth et al recognize the use of a pressure differential to aid in the electrochemical processing/planarizing of the surface of the wafer to remove gas bubbles generated in the tank [0322]. It would have been within the purview of one skilled in the art to provide structure to effect a pressure differential to the surface of the planar member

facing the supported wafer in order to aid in the electrochemical processing/planarizing of the surface of the wafer in removing gas bubbles.

Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Montierth et al (US 2005/0003737) as applied to claim 25 above, and further in view of Barringer et al (US 6,496,001).

The teachings of Montierth et al have been mentioned above but Montierth et al are silent concerning the use of a pressure differential structure/member including a distribution of materials having varying spring constants for applying the differential pressure distribution through the planar member. However, it was known in the planarization art, at the time the invention was made, to provide a pressure differential structure/member having varying spring constants for applying the differential pressure distribution through an adjacent planar member as evidenced by Barringer et al (see claims 5-8). In light of the teachings of Montierth et al to utilize a pressure differential in the removal of gas bubbles in the electrochemical processing/planarization apparatus, it would have been within the purview of one skilled in the art to provide a pressure differential structure/member having varying spring constants as taught by Barringer et al, in the apparatus of Montierth et al, for applying the differential pressure distribution through the adjacent planar member.

Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Montierth et al (US 2005/0003737) as applied to claim 25 above, and further in view of Zuniga et al (US 2004/0192173).

The teachings of Montierth et al have been mentioned above but Montierth et al are silent concerning the use of a pressure differential structure/member including a number of fluid filled chambers for applying differential pressure distribution through the planar member. However, it was known in the planarization art, at the time the invention was made, to provide a pressure differential structure/member having a number of fluid filled chambers for applying the differential pressure distribution through an adjacent planar member as evidenced by Zuniga et al (see [0008-0009]). In light of the teachings of Montierth et al to utilize a pressure differential in the removal of gas bubbles in the electrochemical processing/planarization apparatus, it would have been within the purview of one skilled in the art to provide a pressure differential structure/member having a number of fluid filled chambers as taught by Zuniga et al, in the apparatus of Montierth et al, for applying the differential pressure distribution through the adjacent planar member.

Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sandaiji et al (US 4,982,065) in view of Ballantine et al (US 6,699,400).

The teachings of Sandaiji et al have been mentioned above but Sandaiji et al are silent concerning an inlet and outlet for the solution. However, it was known in the art, at the time the invention was made, to provide an inlet and outlet for introducing and removing solution from a coating tank as evidenced by Ballantine et al (see col. 3, lines 2-10). In light of the teachings of Ballantine et al, it would have been obvious to one of ordinary skill in the art to provide a tank inlet and a tank outlet for the coating solution in order to enable introduction of the solution and

removal of the solution to eliminate the need of the user to manually introduce and remove the solution.

With respect to the use of an in-tank heat exchanger, even though Sandaiji et al are silent concerning an in-tank heater, Ballantine et al recognize the use of a heating filament in tank to maintain the coating solution of a desired temperature (see col. 2, lines 56-59). It would have been obvious to one of ordinary skill in the art to provide a heating filament as taught by Ballantine et al in the tank of Sandaiji et al in order to maintain the etchant coating solution as a desired temperature.

Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sandaiji et al (US 4,982,065).

The teachings of Sandaiji et al have been mentioned above but Sandaiji et al are silent the degree to which the planar member is positionable (i.e., within 3 micrometers) of the top of the supported wafer. However, because Sandaiji et al provide a micrometer (6) to move the planar member relative to the supported wafer in a distance of predetermined micrometers, it would have been obvious to one of ordinary skill in the art to determine via routine experimentation, the appropriate distance in micrometers of which to arrange the planar member relative to the wafer so as to provide the desired treatment to the wafer surface in so long as the wafer was not crushed or damaged.

Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sandaiji et al (US 4,982,065) in view of Bjornson et al (US 6,900889).

The teachings of Sandaiji et al have been mentioned above, but Sandaiji et al are silent concerning the use of reflective surfaces in the tank to facilitate application of the radiant energy in the electrochemical processing of the wafer. However, it was known in the optics/laser art, at the time the invention was made, to provide a reflective coating on a surface in a tank in order to facilitate the application of radiant energy (i.e., laser) in the processing of a substrate as evidenced by Bjornson et al (see col. 5, lines 48-64). In light of the conventional wisdom of the routineer in the optics/laser art as taught by Bjornson et al, it would have been within the purview of one skilled in the art to provide a reflective coating on the inner tank surface of the apparatus of Sandaiji et al in order to facilitate the application of radiant energy or laser energy to the wafer being processed within the tank.

(10) Response to Arguments

Appellants contend that Montierth does not disclose the planar or vibrational member (3802b) capable of being positioned proximate the upper surface of the wafer. This argument is not deemed persuasive because Montierth illustrates in various embodiments, the work support being of varying thickness (see Fig. la versus Fig. 38) so as to position the wafer closer or further away from the planar member and for that matter the energy source too. One of ordinary skill in the art would expect that positioning of the wafer relative to the planar member, which is relative to the energy source, would allow for control of the intensity of radiant energy released on the wafer during electrochemical processing. This is point is clearly evidenced by Montierth, see [0455].

Appellants contend that Montierth does not provide for a radiant energy source because Montierth uses piezoelectric crystals that supply vibrational energy. This argument is not

deemed persuasive because Montierth provides for use of other sources of energy including microwaves, see [0482-0483]. Microwave energy constitutes a radiant energy source.

Appellants contend that Montierth does not provide for the planar member being broadly flexible and locally rigid. This argument is well taken because Montierth does not explicitly provide such a description of the planar member. However, because the planar or vibrational member is capable of being made from a variety of materials that can be flexible yet rigid as evidenced by [0626], the recitation of the planar member being broadly flexible yet locally rigid would not overcome the teachings of Montierth. Furthermore, it would have been common sense to one of ordinary skill in the art that in providing a rigid planar member of an extended length, the ends of the planar member would bow if held at center but the center of the planar member would still be rigid. As such, claim 6 is not deemed patentable over Montierth.

Appellants contend that Montierth does not teach the backing member configured to control a planarity or flatness of the planar member. This argument is well taken in that Montierth does not explicitly teach the backing member configured to control a planarity or flatness of the planar member. However, because Montierth provides for a rigid backing member (3804; quartz [0626]) adjacent the planar member (3802b) as shown in Fig. 38, inherently, the rigid backing member (3804) would effect control of the planarity or flatness of the planar member since the two members are disposed against one another.

Appellants argue that Sandaiji is not concerned with the material deposition on a wafer through electroless plating reactions but with the removal of material from a gapped bar through an etching process. This contention is well founded in that Sandaiji does not teach use of the apparatus for material deposition on a wafer through electroless plating reactions. However,

Sandaiji would still read on the claimed invention because Sandaiji provides an apparatus equivalent in structure to that which is claimed. Regardless, it has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. *Ex parte Masham*, 2 USPQ 2d 1647 (1987). "[A]pparatus claims cover what a device is, not what a device does." *Hewlett-Packard Co. v. Bausch & Lomb Inc.*, 909 F.2d 1464, 1469, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990).

Appellants contend that Sandaiji does not teach or suggest the planar member or quartz window (7) being positioned proximate to the wafer to serve as an upper confinement boundary for material deposited on the wafer through electroless plating reactions because there is no teaching that level adjustment mechanism (6) is capable of positioning the quartz window proximate to the wafer. This contention is not deemed persuasive because Sandaiji provides for the adjustment mechanism (6) that does adjust the position of the planar member or quartz window (7) proximate or near the wafer. The term "proximate" is deemed a relative term such that without an explicit distance claimed, the structure of Sandaiji would still read on the claimed invention.

Appellants contend that Sandaiji does not provide for the planar member being broadly flexible and locally rigid. This argument is well taken because Sandaiji does not explicitly provide such a description of the planar member. However, because the planar member is capable of being made from the same material as the claimed invention, namely, quartz, the recitation of the planar member being broadly flexible yet locally rigid would not overcome the teachings of Sandaiji. Furthermore, it would have been common sense to one of ordinary skill in

the art that in providing a rigid planar member of an extended length, the ends of the planar member would bow or flex if pressed by the ends upon a substrate but the center of the planar member would still be rigid. As such, claim 6 is not deemed patentable over Sandaiji.

Appellants argue that Sandaiji does not direct radiant energy through the planar member such that a substantially uniform amount of radiant energy is applied to the top surface of the wafer because the laser of Sandaiji is used to apply radiant energy to specific locations to etch a desired pattern onto the gapped bar. This argument is not deemed persuasive because Appellants seek to imply that Sandaiji's intended use of the radiant energy source to etch a pattern on the substrate would exclude use of the same radiant energy source to apply uniform amount of radiant energy to the top surface of the substrate. Sandaiji appears to apply uniform radiant energy to the surface of the substrate from Fig. 1. The use of the radiant energy to etch specific locations appears to depend not upon the radiant energy source but upon the lens system (10) which focuses the radiant energy in combination with movement of the substrate on the x-y stage as evidenced by col. 8, lines 36-40. Regardless, the radiant energy source of Sandaiji would be capable of applying uniform radiant energy to the surface of a stationary substrate via an appropriate laser source (i.e., see col. 7, line 58 for different laser types) set at a desired power and focused laser beam dimension (i.e., col. 9, lines 22-26).

Appellants contend that Sandaiji does not teach or suggest the backing member disposed against the backside of the planar member and the backing member defined to control the planarity of the planar member. This argument is not deemed persuasive for alternative reasoning. First, the backing member being against the planar member does not require the backing member to contact the planar member. The backing member can be against or opposed

to the planar member. Sandaiji provide a lens system (10) disposed in opposition to the planar member (7) such that the lens system would still read on the claimed invention. The provision of the lens system (10) to control the planarity or flatness of the planar member would depend upon the type of lens system utilized as well as the intensity of the laser energy source used. In an extreme instance, the lens system would be capable of intensifying the laser energy so as to deform the planar member such that the flatness or planarity of the planar member would be affected. Alternatively, the immersed arms (not numbered) of adjustment mechanism (6) can be construed as a backing member against or in contact with the planar member (7). In that instance, the planarity or flatness of the planar member would be controlled by the degree of pressure applied by the arms.

Appellants argue that Sandaiji is not concerned with deposition of a planarization layer on a substrate through electroless plating reactions but more so with performing a laser-induced etching process on a gapped bar material to form grooves or holes on the surface of the gapped bar. This contention is well founded in that Sandaiji does not teach the intended use of the apparatus for planarization of a substrate. However, Sandaiji would still read on the claimed invention because Sandaiji provides an apparatus equivalent in structure to that which is claimed. Regardless, the case law applied above would still apply. See citation above to *Ex parte Masham* and *Hewlett-Packard Co. v. Bausch & Lomb Inc.*.

Appellants distinctly contend under 103(a), although a 102/103 rejection was applied, that one of ordinary skill in the art, at the time the invention was made, would not have looked to the etching apparatus of Sandaiji for depositing a planarizing layer over a wafer as recited in independent claims 1, 22, and 24. This argument is deemed moot because the intended use of

the apparatus would not warrant grant of patentability over apparatus of the same structure to that which is claimed. In addition, one of ordinary skill in the art would readily appreciate using the structure of Sandaiji for treating a substrate for electroless plating of a substrate because the Sandaiji apparatus is conventionally known to treat a supported substrate within a liquid composition using focus radiant energy without electrodes. It would be within the level of ordinary skill in the art to provide or utilize an appropriate liquid in accordance with the desired product being made.

Appellants contend that remaining dependent claims (i.e., 9, 21, and 25-27) and 103 rejections corresponding thereto, with Montierth or Sandaiji as the sole reference or primary reference, should be withdrawn in view of Appellants arguments against Montierth or Sandaiji. It is the Examiner's position that all remaining dependent claims (i.e., 9, 21, and 25-27) remain rejected in view of the teachings of Montierth or Sandaiji for the reasoning set forth above.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Laura Edwards

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